CLAIMS

What is claimed is:

1. A fluid pumping device, comprising:

an inner member and an outer member which are arranged together for oscillating movement relative to each other; and

a pump mechanism operated by the oscillating movement of the inner and outer members, said pump mechanism comprising a bladder having a first end attached to the inner member and a second end attached to the outer member.

2. The fluid pumping device according to claim 1, wherein said outer member is a tubular member.

3. The fluid pumping device according to claim 2, wherein said inner member is a tubular member arranged within a bore of said outer member.

4. The fluid pumping device according to claim 1, wherein the first end of said bladder is attached to a lower end of the inner member and the second end of said bladder is attached to a lower end of the outer member, and wherein said bladder is arranged to be compressed upon relative movement between the inner and outer members in a first direction and extended upon relative movement between the inner and outer members in a second direction opposite to said first direction.

5. The fluid pumping device according to claim 4, wherein said bladder has corrugations along its length and open ends.

6. The fluid pumping device according to claim 5, wherein said pump mechanism comprises first and second check valves in fluid communication with the first and second ends of the bladder, respectively, said check valves allowing fluid to enter one end of the bladder upon expansion of the bladder and causing fluid to exit the other end of the bladder upon compression of the bladder.

7. The fluid pumping device according to claim 6, wherein said inner and outer members and said bladder are arranged such that downward movement of said inner member within the bore of said outer member causes said bladder to contract and upward movement of said inner member within the bore of said outer member causes said bladder to expand.

8. The fluid pumping device according to claim 1, further comprising a return spring that stores energy during a tension stroke of the inner member and releases energy during a compression stroke of the inner member.

9. The fluid pumping device according to claim 8, wherein at least a portion of said inner member is flexible.

10. The fluid pumping device according to claim 8, wherein at least a portion of said inner member is made of polymeric material.

11. The fluid pumping device according to claim 1, wherein said inner and outer members are concentric tubular members.

12. The fluid pumping device according to claim 11, wherein said bladder is concentric with said inner and outer members.

13. The fluid pumping device according to claim 1, wherein said pump mechanism comprises first and second check valves in fluid connection with an inlet and an outlet thereof, respectively, said check valves each comprising a check ball and a seat on one side of the check ball.

14. A mechanical bladder pump for collecting fluid samples from a well, comprising:

an outer tubular member having a longitudinal bore;

an inner tubular member arranged within the bore of the outer tubular member for oscillating longitudinal movement of the inner member relative to the outer member;

a bladder having a first end coupled to a lower end of the inner member and a second end coupled to a lower end of the outer member, one of the first and second ends of the bladder being in fluid communication with an inlet passage, and the other of said

first and second ends of said bladder being in fluid communication with an outlet passage;

a first check valve arranged in said inlet passage for allowing fluid to enter the bladder through the inlet passage upon expansion of the bladder and preventing fluid from exiting the bladder through the inlet passage upon compression of the bladder; and

a second check valve arranged in said outlet passage for preventing fluid from entering the bladder through the outlet passage upon expansion of the bladder and allowing fluid to exit the bladder through the outlet passage upon compression of the bladder.

15. The mechanical bladder pump according to claim 14, wherein said inner tubular member provides a means for transmitting force for mechanically powering the pump from the ground surface or other point of operation of the pump to the bladder.

16. The mechanical bladder pump according to claim 14, wherein said outer tubular member provides a means for holding the pump in a desired position within a well.

17. The mechanical bladder pump according to claim 14, wherein said inner and outer tubular members are concentric.

18. The mechanical bladder pump according to claim 14, wherein said bladder

has corrugations along its length and is arranged within the outer tubular member for expansion and contraction in a longitudinal direction.

19. The mechanical bladder pump according to claim 14, wherein each of said check valves comprises a check ball, a seat on one side of the check ball, and a projection on the other side of the check ball.

20. The mechanical bladder pump according to claim 14, wherein said second end of the bladder is a lower end of the bladder and is coupled to the lower end of the outer tubular member by a lower bladder adapter, said lower bladder adapter having a projection on its lower end that prevents a check ball of the first check valve from seating against the lower bladder adapter.

21. The mechanical bladder pump according to claim 14, further comprising a return spring that stores energy during a tension stroke of the inner tubular member and releases energy during a compression stroke of the inner tubular member, said spring being arranged to bias the inner tubular member relative to the outer tubular member.

22. The mechanical bladder pump according to claim 21, further comprising a spring retainer secured within the bore of the outer tubular member, said spring retainer having a circular lip on a lower end thereof for retaining the spring in a concentric position relative to the inner tubular member.

23. The mechanical bladder pump according to claim 21, further comprising a spring retainer secured within the bore of the outer tubular member, said spring retainer providing a vertical stop against which an upper end of the spring rests during operation of the pump.

24. The mechanical bladder pump according to claim 21, wherein said first end of the bladder is an upper end of the bladder and is coupled to the lower end of the inner tubular member by an upper bladder adapter, and wherein a surface on an upper end of the upper bladder adapter provides a seat for a lower end of the spring.

25. The mechanical bladder pump according to claim 14, wherein said first end of the bladder is an upper end of the bladder and is coupled to the lower end of the inner tubular member by an upper bladder adapter, wherein said second check valve comprises a check ball retainer attached to said upper bladder adapter, and wherein said check ball retainer has a projection on a lower surface thereof which prevents a check ball from closing said second passage upon compression of the bladder.

26. The mechanical bladder pump according to claim 14, wherein said first end of the bladder is an upper end of the bladder and is coupled to the lower end of the inner tubular member by an upper bladder adapter which functions as a movable piston to compress and expand the bladder during operation of the pump.

27. A fluid pumping device, comprising:

an inner member and an outer member which are arranged together for oscillating movement relative to each other;

a pump mechanism operated by the oscillating movement of the inner and outer members; and

a return spring that stores energy during a tension stroke of the inner member and releases energy during a compression stroke of the inner member.

28. The fluid pumping device according to claim 27, wherein at least a portion of said inner member is flexible.

29. The fluid pumping device according to claim 27, wherein at least a portion of said inner member is made of a polymeric material.

30. A method of collecting a fluid sample from a well, comprising the steps of:

providing a pumping device having an inner member and an outer member which are arranged together for oscillating movement relative to each other in a longitudinal direction, and a pump mechanism comprising a bladder having a first end attached to the inner member and a second end attached to the outer member;

placing the pumping device in a well; and

oscillating the inner member relative to the outer member to mechanically power

the pump mechanism to pump a fluid sample to an outlet of the pumping device.

31. The method of collecting a fluid sample according to claim 30, wherein said oscillating step comprises a tension stroke in which said inner member is pulled upward relative to said outer member to expand the bladder, and a compression stroke in which said inner member is moved downward relative to said outer member to contract the bladder, and wherein said pumping device comprises a return spring that stores energy during said tension stroke and releases energy during said compression stroke.